ECOSYSTEMS VOCAB

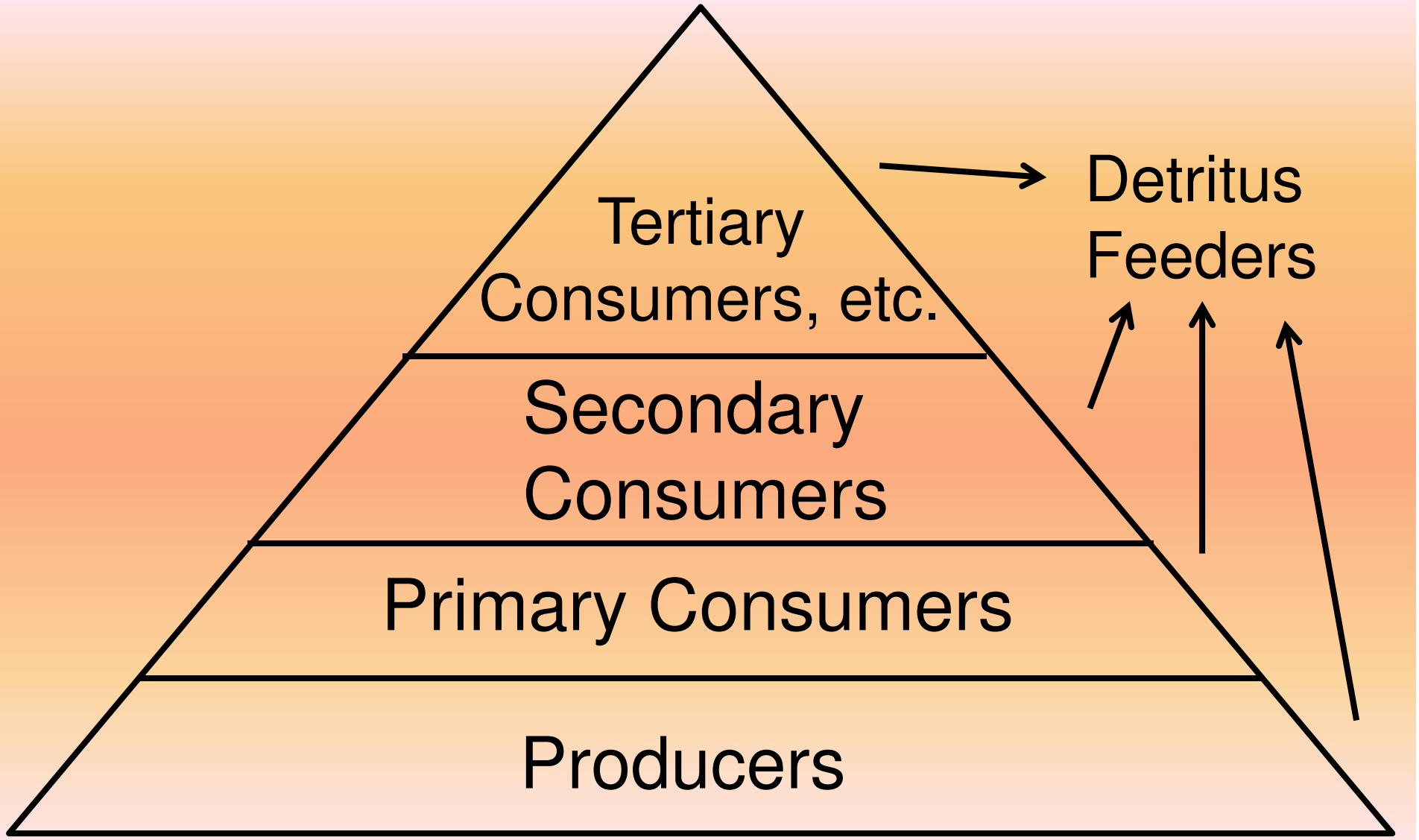
- ***Biotic*** =
  - Factors in the environment that are living or are derived from living things

- ***Abiotic*** =
  - Chemical and physical factors of the environment (nonliving)

- ***Species*** =
  - Smallest group in the classification system of organisms that share similar characteristics and interbreed in nature

- ***Population*** =
  - Group of individuals of the same species in one place at one time
- ***Community*** =
  - Group of different, interacting species in one place at one time
- ***Ecosystem*** =
  - A community of organisms interacting with their abiotic environment
- ***Biome*** =
  - Group of ecosystems that have the same climate and similar dominant organisms
  - Grouped geographically

TROPHIC LEVELS



Autotrophs = ("self nourish")

- Organisms that make their own food using sources of energy and carbon from their physical environment

- Examples
  - ***Chemotrophs*** =
    - Organisms that produce energy from chemical sources
  - ***Phototrophs*** =
    - Organisms that produce energy from light
      - *IE- Photosynthesis*

- Autotrophs are also known as ***producers***
  - Note- Not all plants are producers!
    - Examples
      - Indian pipe (no chlorophyll)
      - Venus fly trap (eats insects)

Heterotrophs = ("different nourish")

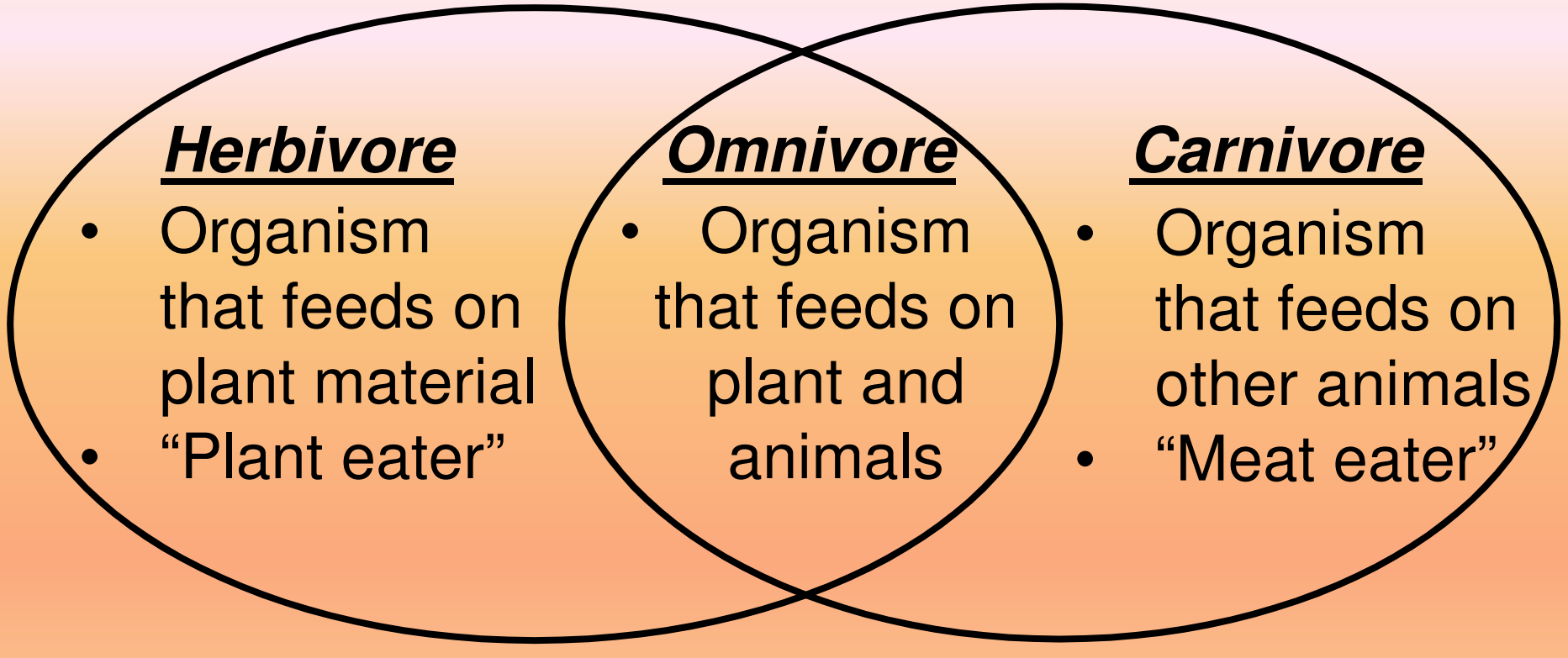
- Organisms that cannot synthesize their own food and are dependent on complex organic substances for nutrition

- Examples
  - ***Consumers*** =
    - Organisms that feed on other live organisms for carbon and energy

- ***Primary consumers***
  - Feed directly on producers
  - Ex-elephants, rabbits, cows
- ***Secondary consumers***
  - Feed on primary consumers
  - Ex-fox, dog, hawk
- ***Tertiary consumers***
  - Uppermost level in a food web that feeds on secondary consumers
  - Ex: hawks, tigers, sharks

- ***Detritus Feeders*** =
  - Organisms that obtain their nutrients and energy by feeding on dead organisms
  - Ex: earthworms
  - Note: Decomposers are specialized detritus feeders whose feeding action results in decay or rotting of organic material
    - Ex: bacteria and fungi

TYPES OF HETEROTROPHS



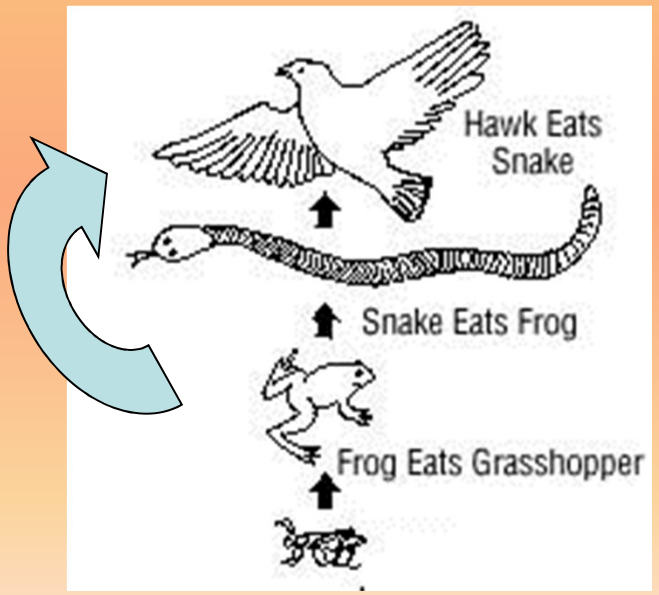
Detritivore

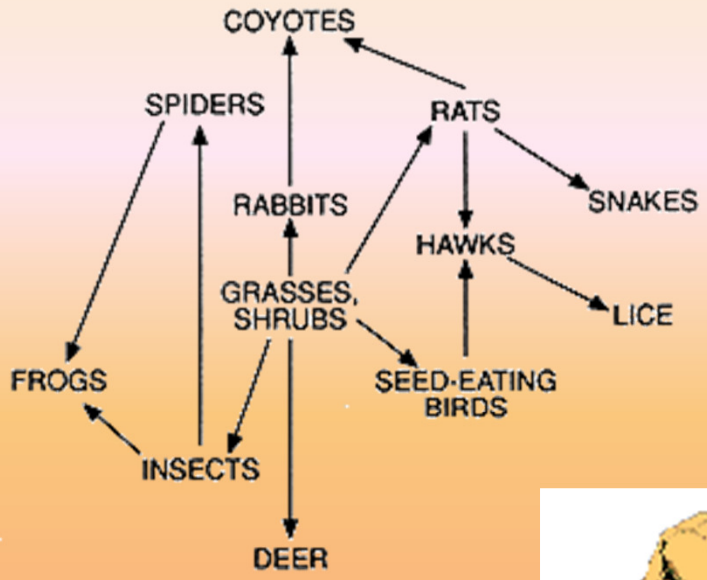
- Organism that feeds on dead and decaying plant or animal material
- IE- Detritus feeders and decomposers

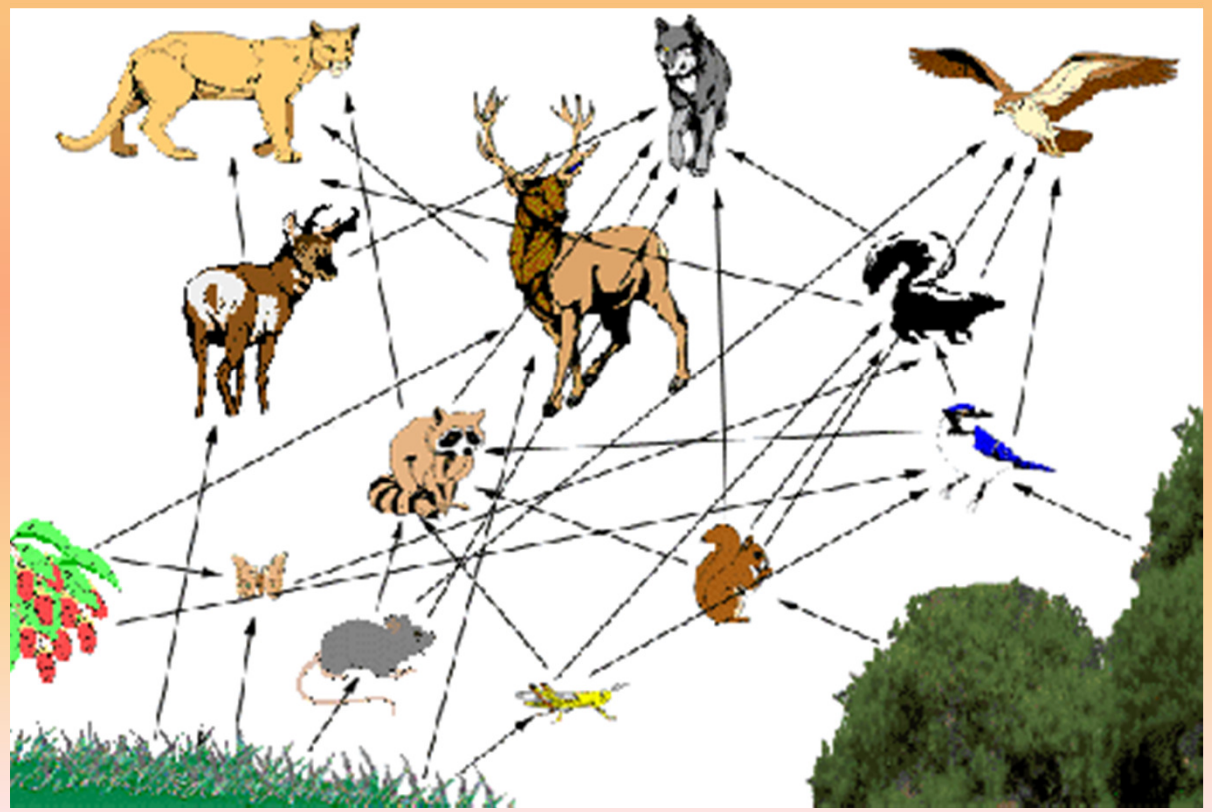
- ***Predator***
  - An animal that attacks and feeds upon another animal
- ***Prey***
  - An animal that is killed and eaten by another animal
- ***Scavenger***
  - An animal that feeds on organisms that are already dead
  - Ex: Vultures, hyenas, raccoons

Energy Flow in Ecosystems

- ***Food chain*** =
  - Transfer of energy and material through a series of organisms as each one is fed upon by the next
  - Seldom exist in isolation
- ***Food web*** =
  - Combination of all the feeding relationships that exist in an ecosystem




COYOTES
SPIDERS
RATS
RABBITS
SNAKES
HAWKS
GRASSES,
SHRUBS
LICE
FROGS
SEED-EATING
BIRDS
INSECTS
DEER



Energy Flow in Food Chain/Web (Note direction of arrows)

- Tertiary Consumers (etc)

(or tertiary detritus feeders)

- Secondary consumers

(or secondary detritus feeders)

- Primary consumers

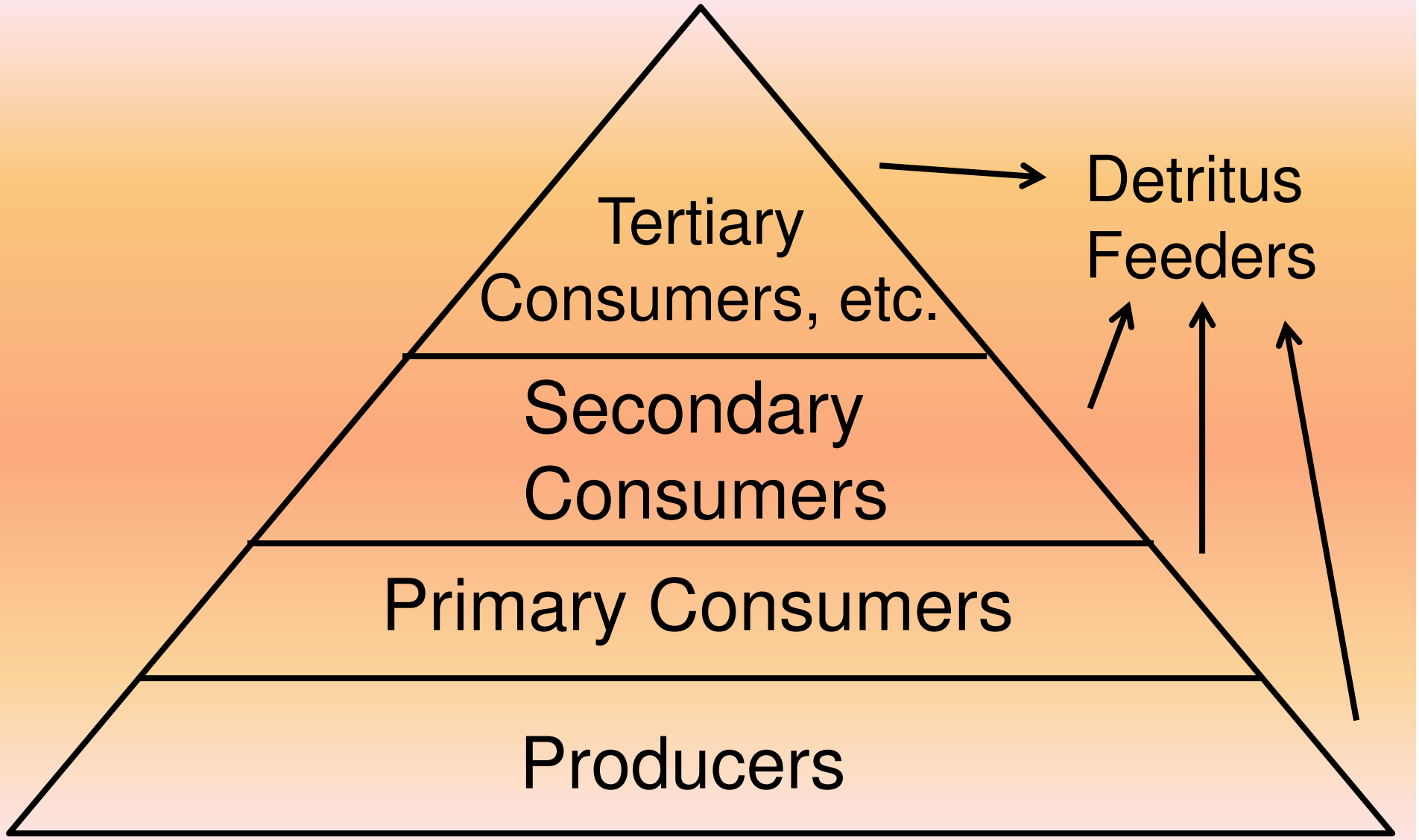
(or primary detritus feeders)

- Producers

KEEP IN MIND

- All food chains/webs must start with producers!!!
- Energy is converted from sunlight to glucose by photosynthetic plants
  - Light + water + carbon dioxide → glucose + oxygen
  - Light + $6H_2O$ + $6CO_2$ → $C_6H_{12}O_6$ + $6O_2$

LET'S REVIEW A CONCEPT



- **Producers** are at the **bottom** of the food web, making up the **largest** group of organisms in the trophic level pyramid

- **Consumers** are at the **top** of the food web, making up the **smallest** group of organisms in the trophic level pyramid

- There has to be more energy at the bottom to support the organisms at the top

- Only 10% of the energy is passed through food webs from organism to organism
  - Some is broken down to do work
  - Some is lost as heat

- Note: Energy flows in a one-way direction through ecosystems
  - It is not recycled
  - It must be continually re-supplied by sunlight!!!

Adaptations

- ***Adaptation =***
  - Fit between organisms and their ecosystems that helps them to survive and reproduce

Types of Adaptations

1. Adaptations for coping with climate and other abiotic factors
   - Thick fur, hibernation, migration
   - Perennial bulbs, deciduous leaves

2. Adaptations for obtaining food and water
   - Long neck, spider web, sharp teeth/claws
   - Root hairs, broad leaves

3. Adaptations to defend against predators

- Camouflage/counter-shading, poison/warning coloration, spray, armor (quills, shells)
- Thorns, toxins

4. Adaptations for attracting mates OR pollination and seed dispersal

- Sounds/calls, mating dance, exotic feathers, elaborate antlers
- Bright colors, fragrance, clinging burs, wings/parachute

SYMBIOTIC RELATIONSHIPS

- ***Symbiosis*** =
  - Situation in which two different species live together in close association
  - Types
    - Parasitism
    - Mutualism
    - Commensalism

- ***Parasitism*** =
  - One organism gets nutrients by taking them from another organism
  - One organism benefits and the other is harmed
  - Unlike predators
    - Typically do not kill their hosts
    - The host provides a home and nutrients
  - Examples
    - Viruses, many bacteria, tapeworm, leeches, mistletoe

PARASITISM

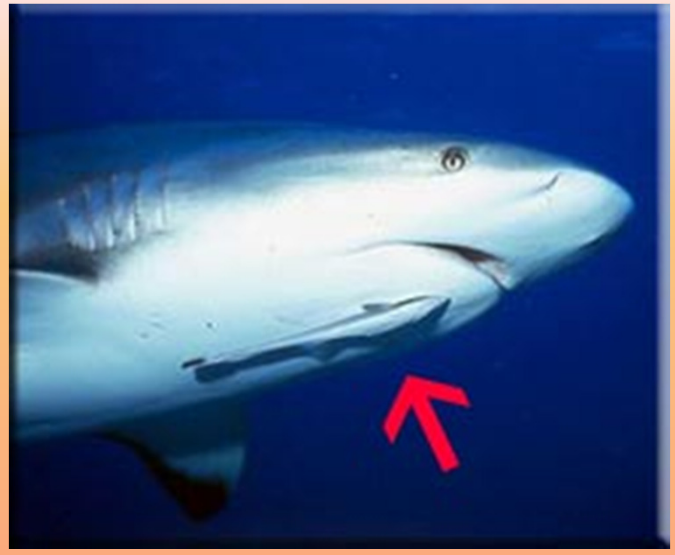
- ***Mutualism*** =
  - Relationship in which both species benefit from each other
  - Examples
    - Clownfish and anemones
    - Flowers and bees (pollination)

MUTUALISM


Alfred B. Maclay Gardens State Park
FloridaStateParks.org
Photo by Mark Ferrulo

- ***Commensalism*** =
  - One species benefits and the other is neither helped nor harmed
  - Examples
    - Decorator crabs
    - Remora and shark
    - Birds and nest in tree

COMMENSALISM



Type of Symbiosis	A	B
PARASITISM	+	-
MUTUALISM	+	+
COMMENSALISM	+	0

COMPETITIVE RELATIONSHIPS

- 2 species that need the same limited resources cannot occupy the same environment
- ***Competitive exclusion principle =***
  - When 2 species compete directly for resources, one eventually excludes the other from the area
- 3 Alternatives to Direct Competition
  - Adapt
  - Migrate
  - Go extinct

- Species may share a **habitat** and minimize competition if each species has own **niche**

- ***Habitat*** =
  - The place where an organism naturally lives
- ***Niche*** =
  - Functional role of a species in the community, including activities and relationships
  - (Think occupation, job)

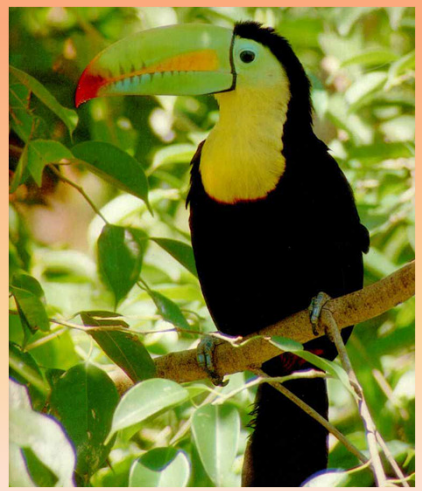
- Species diversity provides ecosystem stability!

- ***Intraspecific competition*** =
  - Competition between members of the SAME species
  - ***Territoriality*** =
    - Behavioral characteristic to mark and defend a territory against other members of the same species
- ***Interspecific competition*** =
  - Competition between members of DIFFERENT species

Cardinals eat sunflower seeds

Woodpeckers eat insects in trees

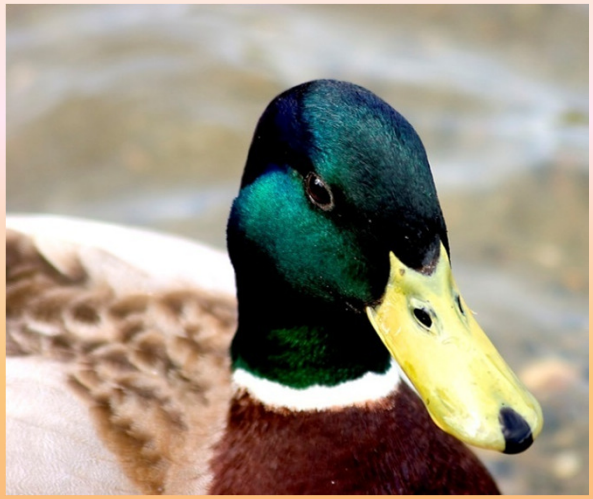
House sparrows eat seeds and insects



Toucans eat fruit

Cassowary- Eats fruit off of ground

Eagles eat meat



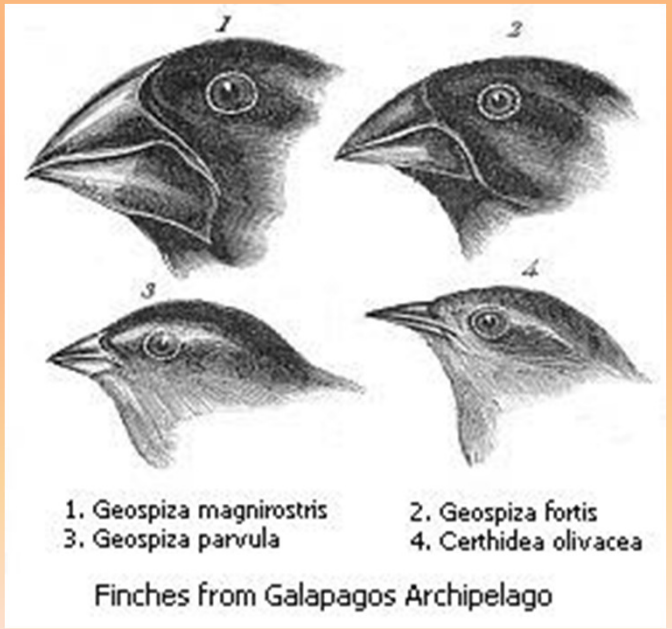
Ducks strain insects

Kiwi digs for worms
(Uses smell)

Loons dive for fish

NATURAL SELECTION

- ***Natural selection*** =
  - Process whereby natural factors tend to eliminate the members of the population that are least adapted



- ***Mutations*** =
  - Accidental changes in a genomic sequence of DNA
    - Can alter a gene
    - Are the original source of new variations
    - May be harmful or beneficial
  - Caused by
    - Radiation, chemicals, viruses
    - Errors during cell division or DNA replication

- ***Genetic Engineering*** =
  - Process of intentionally modifying genes to bring about the expression of a different characteristic
    - Can change the genetic makeup of organisms
  - Examples
    - ***Selective breeding*** =
      - The intentional breeding of organisms with desirable traits in an attempt to produce offspring with similar desirable characteristics

- ***Biotechnology*** =
  - The manipulation of living organisms or their components to produce useful products
    - Medical, agricultural, and ecological applications

PROS and CONS of Genetic Engineering

Pros (+)

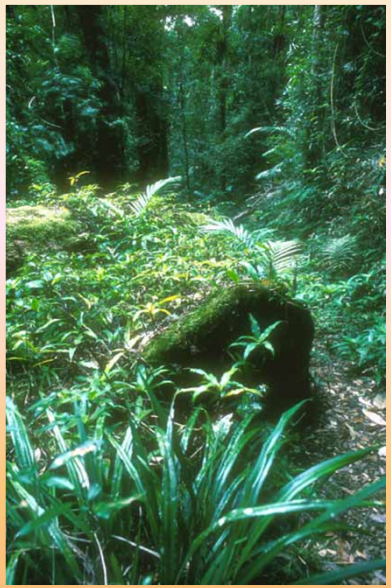
- Prevent human diseases through early detection
- Treat and possibly cure diseases
- Reproduce human organs for transplants
- Improve yield, taste, and nutritional value of crops
- Increase crop resistance to harsh conditions and pests
- Could increase genetic diversity

Cons (-)

- Creation of new pathogens
- Harmful side effects
- Expensive
- Moral/Ethical concerns
- Irreversible effects with unknown consequences
- Could decrease genetic diversity (ie-cloning)

TERRESTRIAL BIOMES

Tropical Rain Forest



- Soil
  - Thin and nutrient poor
- Climate
  - Hot
  - Very wet
    - More than 95 in. of precipitation a year
- Plants and Animals
  - Home to more species than other biomes combined
  - Vines, broad leafed evergreen trees, orchids
  - Exotic colorful insects, amphibians, birds, snakes; sloths, jaguars, monkeys, tigers
- Location
  - Northern South America, Central America, western central Africa, islands in Indian and Pacific Oceans, S.E. Asia

Tropical Savanna

- Soil
  - Some nutrients
- Climate
  - Hot
  - Dry season and wet season
- Plants and Animals
  - Tall grasses and isolated trees
  - Lions, cheetahs, elephants, zebras
- Location
  - Central Asia, subequatorial Africa and South America, northern Australia

Desert

- Soil
  - Thin, porous, and nutrient poor
- Climate
  - Hot days and cold nights
  - Very dry
    - Less than 10 in. of precipitation per year
- Plants and Animals
  - Cacti, thorny bushes and shrubs
  - Rodents, lizards, snakes, insects, owls, hawks, small birds
- Location
  - North and Southwest Africa, parts of Middle East and Asia, Southwest US, northern Mexico

Temperate Grassland

- AKA: Prairie
- Soil
  - Fertile (deep and nutrient rich)
- Climate
  - Warm/hot summers; cold winters
  - 10-60 in. precipitation a year (mostly snow)
- Plants and Animals
  - Lush grasses
  - Large grazing animals (bison), coyotes, bears, hawks
- Location
  - Central North America, parts of South America

Temperate Forest

- AKA: Deciduous Forest
- OUR BIOME

- Soil
  - Fertile (nutrient rich and well developed)
- Climate
  - Warm summers; cold winters
  - 30-80 in. of precipitation throughout the year
- Plants and Animals
  - Deciduous and coniferous trees, ferns, mosses
  - Deer, black bears, raccoons, snakes, squirrels
- Location
  - Western and central Europe, eastern Asia, eastern North America

Coniferous Forest

- AKA: Taiga, Boreal Forest
- Soil
  - Acidic
- Climate
  - Short summers; long, cold winters
  - 15-20 in. precipitation a year but sticks around
- Plants and Animals
  - Redwood, needle-leaf conifers (fir, spruce)
  - Lynx, moose, beavers, bears, elk, owls, weasels
- Location
  - Northern portions of North America, Europe, Asia, extending southward at high elevations

Tundra

- Soil
  - Thin and perpetually frozen (permafrost)
- Climate
  - Long, cold, dark winters and strong winds
  - Less than 5 in. precipitation a year, but sticks around
- Plants and Animals
  - Mosses, lichens
  - Caribou, snowy owl, arctic fox
- Location
  - North of coniferous forest in northern hemisphere, extending southward at elevations above the coniferous forest

SUCCESION AND SUSTAINABILTY

- ***Succession =***
  - Change in the species that occupy an ecosystem
- Some species invade and become more numerous
- Others decline in population and disappear
- Caused by a change in one or more abiotic or biotic factors that benefits some species at the expense of others

- ***Climax ecosystem*** =
  - Populations of all organisms are in balance with each other and with existing abiotic factors
  - The last stage in ecological succession
- ***Primary succession*** =
  - Gradual establishment, through a series of stages, of a climax ecosystem in an area that has not been occupied before
  - Example: rock face
- ***Secondary succession*** =
  - The reestablishment, through a series of stages, of a climax ecosystem in an area from which it was previously cleared

- ***Keystone species*** =
  - A species whose role is essential for the survival of many other species in an ecosystem
  - Example:
    - Starfish feed on mussels
    - Allows barnacles, anemones, and other organisms to live on the rocks there
    - Starfish removed = other organisms crowded out
- Removing keystone species decreases species diversity
- Remember,
  - Species Diversity = Ecosystem Stability

- ***Critical number*** =
  - Minimum number of individuals required to maintain a healthy population
  - If population falls below, extinction common
  - ***Threatened*** =
    - Species whose populations are declining rapidly
  - ***Endangered*** =
    - Population is near critical number